fluid in the cylinder was retained by means of an unsupported area seal as described by Bridgman (1914*a*). The displacement of the piston was observed by means of a dial gauge calibrated in mils. For successive small equal increments of pressure on the ram of the press the increments of dial gauge reading were noted; these decreased as the compressibility of the fluid decreased until a sharp increase denoted yielding at the bore of the test cylinder. This is illustrated in curve (*a*) of Figure 2. The pressure on the hydrualic ram at this point was used to calculate the yield pressure of the test cylinder.

TABLE 2

RESULTS OF PRESSURE TESTS

Series No.	Cylinder No.	K	Yield Pressure (atm)	$(K-1)\sigma_y$ (atm)	a	a_1	β
1	1	1·50	1950	2200	1·13	1·00	0·267
	2	2·00	3460	4400	1·27		
	3	3·00	5710	8800	1·54		
	4	3·50	6470	11000	1·70		
	5	4·00	7400	13200	1·78		
2	1	1·50	3740	4665	1·25	1·01	0·477
	2	2·00	6280	9330	1·49		
	3	2·50	8350	13995	1·68		
	4	3·00	9470	18660	1·97		
	5	3·50	10230	23325	2·28		
	6	4·00	11730	27990	2·39		
	6A*	1·60	4320	5600	1·30		
3	1	1·51	4020	5550	1·38	1·0†	0·616
	2	1·77	5530	8380	1·52		
	3	2·02	7120	11100	1·56		

* After testing, cylinder No. 6 (1 in. outer diam.) was bored out to $\frac{5}{8}$ in. inner diam., thus removing metal which had suffered permanent deformation. It was then retested in a larger press giving the yield pressure shown.

† With fewer results and rather more scatter than in the other series the correlation was assumed to pass through the point $= 1, K = 1$.

After a test the outer diameter of a cylinder was found to have increased by from 1 to 3 mils, indicating that permanent set had taken place.

It will be seen that, under the conditions of test no axial stress occurred in the cylinder walls due to the pressure, so that the cylinders were effectively open-ended. Earlier experimental work of this nature has mostly been made on cylinders with closed-ends.

The correlation between ram pressure and the pressure developed in the test cylinder was found by observing pressure-induced phase transitions in several liquids. This was done in a hardened steel cylinder of 1 in. outer diameter and the same bore as the test cylinders. Such phase transitions are accompanied by a volume decrease

at constant pressure (illustrated in curve (*b*) of Fig. 2) and this was detected on the dial gauge mounted as before. The pressure in the cylinder was then assumed to be the transition pressure given by Bridgman. The liquids used were bromobenzene (Bridgman 1915); chloroform, carbon tetrachloride (Bridgman 1914*b*); and water (Bridgman 1911). A linear equation between developed pressure and ram pressure was fitted to these results by the method of Least Squares.

The press with test cylinder in position is presented in Figure 3.

TABLE 3
PUBLISHED DATA

No.;* Reference	Material	Type of Failure	Relevant Tensile Stress (ton/in.^{2})	No. of Tests	Range of K	α_1	β	S.D. in α
1 Cook and Robertson (1911)	Mild steel	Yielding	15·2–16·5	27	1·35–3·65	0·820	1·362	0·08
2 Macrae (1930)	Nickel steel	,,	32·3–43·2	4	2·15–2·50	0·506	2·043	0·03
3 Cook (1932)	Mild steel	,,	19·5	9	1·40–3·00	0·672	1·466	0·03
4 Cook (1932)	,,	,,	19·5	7	2·70–3·94	0·637	1·376	0·01
5 Cook (1932)	,,	,,	19·5	6	3·00–7·00	0·466	1·304	0·04
6 Cook (1934)	,,	,,	23.4	6	1·17–4·00	0·866	1·559	0·04
7 Cook and Robertson (1911)	Cast iron	Bursting	8·3–12·0	8	1·30–2·96	0·867	0·770	0·08
8 Cook and Robertson (1911)	Mild steel	,,	24·3–26·3	9	1·35–1·79	0·954	0·584	0·06
9 Crossland and Bones (1955)†	,,	,,	32·9	9	1·33–3·72	1·023	0·467	0·02

* Numbers identify the sets of results on Figures 4 and 5.
† This analysis taken from Leinss (1955).

III. RESULTS

The Leinss factor α was calculated for each cylinder from the relation

$$\alpha = \frac{(K-1)\sigma_y}{P_y}, \qquad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where σ_y is the yield stress found from the tensile test,

P_y is the yield pressure of the cylinder.

For each series of cylinders the values of α were correlated according to equations of the form (**1**) and the parameters α_1 and β determined. Table 1 shows the results of the tensile tests and Table 2 the results of the pressure tests.

The analysis of previously published data is summarized in Table 3, individual plots of α against K being shown in Figures 4 and 5.